

Executive Summary



A REVIEW OF THE RANGE OF IMPACTS AND BENEFITS OF THE COLUMBIA RIVER TREATY ON BASIN COMMUNITIES, THE REGION AND THE PROVINCE

This report provides an overview of the impacts and benefits of the Columbia River Treaty (the Treaty) to the Columbia Basin (drainages into the main stem of the Columbia River north of the 49th parallel) in Canada and to the Province of B.C. It has been prepared in response to input received from Basin residents during provincial consultation sessions in the spring of 2012. At these sessions the public requested that a summary be created that documented what is known about the range of impacts and benefits in the Basin resulting from the creation and operation of the Treaty Dams and associated reservoirs.

Information in this report is drawn from existing reports, publications and web sources. The information provided is included as it was presented in those reports. No additional research was undertaken to either verify information or to provide an analysis of net benefits either to the Basin or to the communities most affected, or to define the current scope or scale of unaddressed or partially addressed impacts, other than how they have been addressed in other reports.

Impacts on First Nations and related communities are not addressed in this report. A separate information gathering and consultation process is being conducted with First Nations by the Province and Canada.



1. Treaty Background

The Columbia River Treaty was signed by Canada and the United States in 1961 and was ratified in 1964. BC Hydro and the Province (for the purposes of the disposal of the Canadian Entitlement) are appointed as the Canadian Entity under the Treaty while Bonneville Power Administration and the U.S. Army Corps of Engineers jointly provide these functions in the U.S. Under the terms of the Treaty, BC Hydro built and now operates 15.5 million acre-feet (MAF) of storage at the Mica (7.0 MAF), Hugh Keenleyside (7.1 MAF), and Duncan (1.4 MAF) projects, in co-ordination with the United States, to maximize power generation and flood control benefits in both countries. The Treaty also authorized the construction of the Libby Dam in the United States, which created the Koochanusa reservoir (5 MAF) that floods back 67 kilometres into Canada.

Under the Treaty, each party (Canada or the U.S.) accepts that any local or sub-regional impacts that occur as a result of the Treaty are the responsibility of the government within whose jurisdiction these impacts occur, in this case the Province and BC Hydro. Further information on the Treaty can be found at <http://gov.bc.ca/columbiarivertreaty/>.

2. General Benefits and Impacts

Canada (B.C.) received an up-front lump sum pre-payment for the annual flood control benefits in the U.S. in the amount of US \$64 million. That payment covered the benefits of an assured annual flood control plan for the first 60 years of the Treaty (i.e. to September 2024). In addition, the Province of B.C. receives one-half of the potential annual additional power generation benefits agreed to be produced at the downstream U.S. projects resulting from the water flow regulation provided by Canadian storage under the Treaty (Canadian Entitlement). The first 30 years of those Canadian Entitlement benefits were sold to the U.S. for a lump sum of US \$254 million payable in 1964. After the 30 year sale period expired, the benefits began to return to the Province of B.C. beginning in 1998, and reverted to full provincial ownership in April 2003.

Other general benefits of the Treaty to Canada (B.C.) include:

- Flood damage mitigation, particularly around Trail, Castlegar, Revelstoke, Creston and Kootenay Lake;
- At-site electricity generation at Mica Dam;
- Provision for an additional 5 MAF of Non-Treaty storage in Kinbasket Reservoir;
- Ability to develop additional generating facilities that benefit from flow regulation provided by upstream Treaty storage including: Kootenay Canal (1975), Revelstoke Dam (1984), Arrow Lakes Generating Station (2002), Brilliant Expansion project (2007);
- Generating facilities provide employment, and create spin off industries and services from construction, ongoing operations and periodic upgrades;
- Columbia Power Corporation and Columbia Basin Trust regional investment and related employment;
- Since the full return of the Canadian Entitlement benefit between 1998 and 2003, annual delivery of at least 1,176 megawatts (MW) capacity and potential for up to 4,073 GWh¹ of energy to the British Columbia border over the last 10 years, worth \$100-300 million annually; and
- As part of the BC Hydro system, power generation at Columbia Basin facilities helps to provide approximately 44% of low-cost electricity to B.C. residents and businesses.

¹ Gigawatt hours, abbreviated as GWh, is a unit of energy representing one billion (1,000,000,000) watt hours and is equivalent to one million kilowatt hours.



2. General Benefits and Impacts

The general impacts (footprint and operational) of Treaty dams and subsequent additional development include:

- Inadequate consultation with Columbia River basin residents and First Nations when the Treaty was negotiated and initially implemented;
- The reservoirs created by the Duncan, Keenleyside, Mica and Libby dams, and the Non-Treaty Revelstoke Dam inundated approximately 60,000 hectares (231 square miles) of valley land;
- Over 50,000 hectares of lakes, rivers, wetlands, ponds, streams and riparian areas and related habitat for fish, wildlife, waterfowl, bird and other species was impacted;
- Approximately 2,300 people were displaced and more than a dozen small communities were inundated primarily in the Arrow Lakes and Koochanusa Reservoirs;
- From an economic perspective, these areas were fertile and productive valley bottom lands;
- Economic activities and potential related to forestry, agriculture, forestry, recreation and tourism were also diminished;
- Flooding also impacted traditional First Nations' cultural sites;
- The rise and fall of reservoir water levels as a result of current operations continue to affect the surrounding ecosystems, tourism, forestry and recreation and cultural interests; and
- Lack of understanding of how the system is operated, and lack of knowledge of how decisions are made have resulted in a feeling that regional interests are not adequately accommodated in on-going operations.

3. Specific Impacts

The three Canadian Treaty dams and reservoirs and the Libby Dam were all constructed between 1964 and 1973. The Revelstoke Dam and generation complex was completed in 1985. The areas affected by the reservoir inundation at full pool reservoir are shown in Table 1.

The Kinbasket and Arrow Lakes reservoirs inundated the largest areas of both water and land. In reviewing the impacts and benefits, all reservoirs had similar types of impacts, although at different scales.

Area of Pre-Dam Aquatic and Terrestrial Ecosystems inundated by the Treaty and Revelstoke Reservoirs (ha)						
	Mica/ Kinbasket	Revelstoke	Keenleyside/ Arrow	Libby/ Koocanusa (B.C.)	Duncan	Total
Lakes	2,343.0	0	34,992.3	0	2,583.9	39,919.2
Rivers	4,896.6	2,654.4	2,021.9	1,490.1	424.5	11,487.5
Streams	192.1	53.4	50.6	10.3	17.7	324.1
Shallow ponds	555.1	26.9	102.9	210.6	172.3	1067.8
Gravel Bars	235.6	56.9	3,262.8	80.4	22	3,657.7
Wetlands	5,862.6	456	3,431.6	1,071.9	1,824.5	12,646.6
Floodplains, Riparian Forests	15,526.5	4,004.7	3,563.5	2,173.1	1,396.6	26,664.4
Upland Ecosystems	13,035.7	4,199.1	3,844.3	1,646.8	860	23,585.9
Total	42,647.2	11,451.4	51,269.9	6,683.2	7,301.5	119,353.2

TABLE 1

The impacts reported here are drawn mainly from the Arrow Lakes, Revelstoke, Golden and Valemount community reports that were developed by local government organizations and created in 1994 as part of an effort to gain compensation for the Treaty related development impacts. Other documents

including reports from the Columbia Basin Fish and Wildlife Compensation Program, and People in the Way by J.W. Wilson (1973) were also considered. There were no community reports developed for the Duncan Dam or Koocanusa Reservoir. However, many of the reported impacts can be assumed to also apply to those areas.



3. Specific Impacts

Biophysical Impacts

The main reported biophysical impacts include:

- The loss of rivers, lakes, streams and riparian areas affected the fisheries in each of the reservoirs;
- The loss of wetlands, riparian areas, and upland areas affected the habitat of mammals, waterfowl, and other birds, and other species types. Entire ecosystems were removed;
- Other natural features such as hot springs were lost;
- At low water, the drawdown areas create mud and silt flats that are both unsightly and ecologically unproductive;
- In reservoirs with higher drawdowns such as Kinbasket, Arrow Lakes and Kooconusa, high winds create dust storms at low water levels;
- There are reported localized reservoir related weather impacts including higher winds, less snow and more rain, and winter fog; and
- There are reported higher levels of insect infestations at certain times of the year.

Social Impacts

The main reported social impacts include:

- Lack of consultation leading up to the Treaty left people feeling that their views, concerns and needs were not adequately addressed;
- Commitments made about future development of infrastructure and economic development opportunities were not delivered by the Province and/or BC Hydro;
- There are ongoing concerns that both the process of reaching acquisition settlements for the private lands, and the amount of compensation received, were inadequate;
- Residents' perception is that there has been a lack of adequate measures to address the social, environmental and economic impacts and remain as a source of hurt, anger and mistrust;
- Communities lost access to “unspoiled wilderness”, with forests, wildlife and fish, and related recreation experiences;
- Over 2,300 people were displaced and over a dozen small communities, their infrastructure, public spaces and way of life were lost primarily in the Arrow Lakes and Kooconusa Reservoirs; and
- Archeological sites were also inundated.



3. Specific Impacts

Economic Impacts

The main reported economic impacts include:

- Loss of tourism, recreation activities and future tourism potential;
- Lack of development of suitable water and land based recreation infrastructure and access after development;
- Fluctuating water levels, floating debris, and visual impacts at lower water levels, also place constraints on tourism and recreation opportunities;
- Loss of rail and road infrastructure;
- Significant reduction in Hamber Provincial Park;
- Loss of wildlife, waterfowl and fisheries resulted in both consumptive and non-consumptive hunting and recreation impacts;
- Loss of productive forest land and related economic opportunities and reductions in annual allowable cut;
- Loss of opportunities to generate more local benefits by not fully harvesting the reservoirs prior to flooding;
- Increased costs to forestry operations due to limitations in access, increased need for water based access and transport and more extensive and difficult to access harvest areas and terrain;
- Loss of arable farmland and orchards, especially in the Arrow Lakes and Kooocanusa reservoirs;
- Loss of tax revenue related to the loss of private lands affected both educational and municipal funding;
- Grants in lieu of taxes are not related to either municipal impacts or expenditures;
- Employment benefits of the construction of Treaty and related facilities and related permanent employment have not significantly benefited some of the most affected communities; and
- Small communities had little capacity to adapt to these changes and develop economic alternatives.



4. Mitigation and Benefits to the Region

Development Mitigation

During the process of project development, the Province and BC Hydro did make some investments to mitigate impacts. Some of those investments include:

- Relocation of the communities of Edgemont, Fauquier and Burton and creation of residential lots in other locations for resettlement;
- Development of new water supply systems in the Trail and Castlegar areas;
- Hospital expansions in Castlegar and Mica Creek;
- Development or improvement of some public roads and logging roads;
- New ferry infrastructure on Arrow Lakes;
- Development of a construction camp at Mica Creek;
- Dyking and bank stabilization in Revelstoke and Nakusp;
- Development of some boat launch and marina facilities; and
- Development of infrastructure and community facilities in Revelstoke.

Environmental Compensation Programs

The BC Hydro Columbia Basin Fish and Wildlife Compensation Program (FWCP-Columbia) was established in 1995 to sustain and enhance fish and wildlife populations by undertaking projects with the potential to mitigate footprint impacts resulting from BC Hydro projects, and to meet water license obligations. The program covers all of the BC Hydro facilities in the Basin. It started with an annual budget of \$3.2 million per year, tied to inflation. The current budget is \$4.5 million. Since 1995, FWCP-Columbia has invested more than \$65 million in approximately 750 projects related to fish and wildlife in the Columbia region.

Columbia Power Corporation (CPC) has a similar Environmental Program to address the impacts of the Arrow Lakes Generating Station, the Brilliant Dam and Brilliant Expansion Project, and the Waneta Expansion Project. Over the last 3 years, CPC has invested \$486,600 annually in this initiative.

4. Mitigation and Benefits to the Region

Water Use Planning

To address issues of declining fish stocks and aquatic habitat, and consequently water management, as well as the relationship between fish, flood protection, recreation, other water uses and power generation at hydroelectric facilities the Province initiated the requirement to develop Water Use Plans for BC Hydro water control structures. The Columbia River water use planning process started in 2000, and an initial plan was developed in 2004. An update to that plan was completed in 2007. As a result of that process, approximately \$115 million will be invested between 2008 and 2020 to address issues such as flow management for various interests including navigation, recreation, fisheries, flood control, habitat, nutrient enhancement, migration, stranding and other issues related to fish, waterfowl habitat, ongoing dust and debris concerns, ongoing reservoir access and access maintenance concerns, wetland protection, riparian and wildlife habitat and heritage protection. A similar process was undertaken for the Duncan Dam. The Duncan Dam estimated budget is \$13.5 million for the 2008 to 2018 period. To date, approximately \$53 million has been invested from these two programs.

Columbia Basin Trust

Columbia Basin Trust (CBT) was created in 1995 to support efforts by the people of the Basin to create social, economic and environmental well-being in the Canadian portion of the Columbia River Basin - the region most affected by the Columbia River Treaty. During the creation of the Treaty, Basin residents weren't adequately consulted for their views, concerns or solutions. In the early 1990s, the people of the Basin seized the opportunity to get involved. Residents, local officials and representatives from regional districts and tribal councils joined together to coordinate efforts, forming the Columbia River Treaty Committee. Reflecting the desires of the people of the Basin, the committee approached the Province of B.C. in order to negotiate:

- that funds be allocated to the region, representing a fair share of the ongoing benefits being realized outside of the Basin as a result of the Treaty; and
- that a regional organization, governed by a board of Basin residents, be created to manage those funds.

4. Mitigation and Benefits to the Region

Negotiations were successful on both counts, and, in 1995 the *Columbia Basin Trust Act* was passed through the B.C. legislature and CBT was established. A binding Financial Agreement was also established which resulted in the following for the residents of the Basin through CBT:

- \$276 million over ten years to finance power project construction in partnership with Columbia Power Corporation;
- \$45 million up front, which CBT used as an endowment; and
- \$2 million per year from 1995 to 2010 for operations.

Using the income earned, from its power projects and other investments, CBT's Delivery of Benefits activities supports programs and initiatives which focus on fostering quality of life and addressing critical issues in the Basin. In 2011/12, CBT disbursements to communities were over \$18 million. CBT initiatives include Community Development, Water, Environment, Economic, Social and Youth. Since 1996, CBT total delivery of benefits to communities has been approximately \$90 million.

Current levels of benefits are expected to continue at about the same level, until 2015/16, when Wantea Expansion begins to

produce power. Those additional revenues and increased revenues from a new sales agreement for the Arrow Lakes Generating Station will mean that by 2017/18 projected annual benefits to communities are expected to be double the current levels.

Columbia Power Corporation

The province also established Columbia Power Corporation (CPC) and endowed it with \$250 million to act as a joint venture partner with CBT. Together they have purchased the Brilliant Dam, constructed the Arrow Lakes Generating Station, the Brilliant Expansion Project, and the Waneta Expansion project, currently under construction. Net income from these power projects is shared based on each organization's ownership proportion of the specific project.

Regional Flood Mitigation

The water management benefits of the dams and reservoirs have significantly reduced the risk of flooding, especially in Castlegar, Trail, Creston and Kootenay Lake. Water flows this summer, for example, were similar to 1948 and 1961 when there was extensive flooding.

4. Mitigation and Benefits to the Region

Grants in Lieu of Taxes (GILT)

Although publicly-owned power facilities in the Columbia Basin generally do not pay municipal property taxes and school taxes, they do pay municipalities and regional districts grants in lieu of taxes. The exception is the Brilliant Dam, which continued to pay property taxes after it was acquired by CPC and CBT from Cominco in 1996. The grants-in-lieu formulas provide funds to local governments impacted by reservoirs, in addition to the local jurisdiction in which a dam and powerhouse is located.

In 2012, for the Treaty dams (Mica, Keenleyside and Duncan) the grants paid in the amount of \$1,961,530 were paid to Columbia-Shuswap Regional District (RD), Fraser-Fort George RD, Village of Valemount, Central Kootenay RD, City of Castlegar and the Village of Nakusp. The GILT for the Revelstoke Dam in 2012 was \$2,340,686 paid to Columbia-Shuswap RD and the City of Revelstoke and the GILT for the Kootenay Canal was \$ 832,132 paid to Central Kootenay RD and the City of Nelson. Columbia Power Corporation paid a total GILT of \$473,890 for the Arrow Lakes Generating

Station and the Brilliant Expansion project to the Regional District of Central Kootenay, the Village of Nakusp, and the City of Castlegar.

Construction Employment

For the nine year construction period of the three Treaty dams, projected employment was estimated to be 17,850 person years.

The Revelstoke Dam created a further 11,055 direct person-year jobs, and the Kootenay Canal Generating Station produced 2,000 person years of construction employment. Subsequent projects such as the Arrow Lakes Generating Station, the Brilliant Expansion project, and Revelstoke Unit 5 and the Duncan Dam spillway improvements have added approximately 2,000 person years of employment. There is currently construction underway at Mica Dam, the Keenleyside Dam and at the Waneta Expansion Project. Future projects include Revelstoke Unit 6 and improvements to the Kootenay Canal facility. Since the Treaty was established, there have been approximately 33,000 person years of employment, or an average of over 685 construction jobs per year since 1964.

4. Mitigation and Benefits to the Region

Permanent Employment

To manage the Treaty and related facilities, BC Hydro employs permanent staff in the Basin. For the 2012/13 fiscal year, BC Hydro has a total of 109 permanent and 11 temporary employees, and has an additional \$4.3 million budgeted for contracted work. This total does not include transmission line crews. There is one permanent employee with the Fish and Wildlife Compensation Program.

In addition, Columbia Power Corporation has 40 permanent employees, and the Columbia Basin Trust has 42 permanent employees. Annual employment budgets for these positions are approximately \$24 million. It is not clear how much additional employment is generated from contracted services provided to these organizations and programs, but the total value of contracted services is approximately \$16 to \$18 million per year.

Tourism and Recreation

The reservoir system in the region created opportunities for new recreational and tourism benefits. Private facilities and services, and BC Parks and Forestry Recreation Sites and

Ecological Reserves that support tourism and recreation activities, have been developed in association with the dam facilities and reservoirs.

BC Hydro has a Visitors Centre at the Revelstoke Dam, a trail at the Kootenay Canal, and a lock in the Keenleyside Dam provides both commercial and recreational services. BC Parks has developed Cummins Lake Provincial Park and Foster Arm Protected area on the Kinbasket Reservoir, and the Cummins River Protected area and Goosegrass Creek Ecological Reserve have been established. There are also several Forestry Recreation Sites on the Kinbasket Reservoir including Canoe Reach Marina.

Martha Creek Provincial Park has been established on the Revelstoke Reservoir as well as the Five Mile boat launch. Syringa, Blanket Creek, McDonald Creek and Shelter Bay Parks have been established on the Arrow Lakes Reservoir. Duncan Reservoir has two Forestry Recreation sites with boat launches. Kikommon Creek Provincial Park and Wardner Provincial Park (day use) have been established on the Kooconusa Reservoir. Total 2010/11 visitation to Provincial Parks noted above was 364,654.

5. Provincial Benefits

Power Generation

One of the goals of the Treaty was to increase the opportunities to generate electricity. The current BC Hydro projects in the Columbia Basin (Mica, Revelstoke, Kootenay Canal) have a total installed capacity of 4,620 MW. Actual generation depends on water flow, and has varied between 16,000 and 20,000 GWh annually in recent years. That capacity, along with other smaller BC Hydro and Columbia Power Corporation facilities in the region, now constitutes approximately 44% of BC Hydro's total generation capacity.

Canadian Entitlement

Under the Treaty terms, Canada is entitled to half of the additional potential power agreed to be generated in the U.S. resulting from improved water regulation. These rights were transferred to the Province in 1963, and Canada pre-sold the first 30 years of those benefits in 1964. Between 1998 and 2003, those benefits began to be returned to B.C. in various amounts, and as of April 2003 are now fully returning. The Canadian Entitlement is currently worth about \$100-\$300 million annually (varies with market prices).

That power is marketed on behalf of the Province by Powerex, a BC Hydro subsidiary. Over the last 10 years, annual revenue from the sale of the Canadian Entitlement has averaged approximately \$202 million and goes into the Province's Consolidated Revenue Fund.

Water License/Rental Payments

Under the *Water Act* and Water Regulation, the Province requires users of publically owned water to pay annual fees known as water rentals. Water rentals are based on the size of the generating facility, the volume of storage and annual power output. Over the last 10 years, those annual fees have been, on average, \$46.7 million for Mica, \$53.4 million for Revelstoke and \$19.2 million for the Kootenay Canal Facility.

In addition over the last 2 years, Columbia Power Corporation has paid an average of \$4.47 million for the Arrow Lakes Generating Station and \$2.33 million for the Brilliant Expansion Project. Water license rentals go into the Province's Consolidated Revenue Fund.

5. Provincial Benefits

Provincial Crown Land Occupation Fees

There is also a Provincial fee for the use of the crown land that the facilities and storage occupy. Those annual fees are currently \$266,700 for Mica/Kinbasket, \$54,223 for Revelstoke, \$27,316 for Arrow Lakes and \$18,681 for Duncan and also go into the Province's Consolidated Revenue Fund.

BC Hydro and CPC Payments to the Province

Generation capacity in the Columbia Basin contributes to the net income of BC Hydro. Although there is no facility-specific link to income, if the share of Basin capacity is used to estimate a share of net income, over the last three years, these facilities have generated approximately \$179m (2009/10), \$236m (2010/11), and \$246m (2011/12) of net income for BC Hydro.

BC Hydro is required to make an annual payment to the Province, on or before June 30 of each year, equal to 85 per cent of BC Hydro's net income for the most recently completed fiscal year, assuming that the debt to equity ratio, as defined by the Province, after deducting the Payment, is not greater than 80:20.

The dividend in 2010/2011 was \$463 million and for the year to date at March 31, 2012 is \$230 million. Over the last ten years, that approximate Basin component has averaged \$105.7 million per year. These payments go into the Province's Consolidated Revenue Fund.

The net income for Columbia Power Corporation for the last 3 years was \$14.9 million, \$17.3 million and \$14.7 million respectively. Columbia Power Corporation pays an annual dividend to the Province of B.C. of \$2 million. This dividend goes into the Province's Consolidated Revenue Fund.

Non-Treaty Storage Agreement (NTSA)

BC Hydro designed and built the Treaty storage projects (Mica, Arrow and Duncan) with more than 5 Million Acre Feet (MAF) of additional usable storage than the 15.5 MAF required under the Treaty. Most of this extra volume is physically located at Mica but is contractually not attached to any specific project or location. This additional water storage space is referred to as Non-Treaty Storage, and is utilized under a long term commercial agreement between BC Hydro and the Bonneville Power Administration (BPA).

A scenic landscape photograph showing a calm lake in the foreground, a gravelly shoreline, and a wooden bench under a large evergreen tree. The background features a dense forest of evergreens and mountains under a clear sky.

5. Provincial Benefits

The NTSA essentially allows BC Hydro and BPA to fine-tune the Treaty-specified releases of water across the B.C. – U.S. border in response to prevailing loads, market prices and non-power interests such as ecosystem and fisheries protection. BC Hydro estimates the average hydroelectric generation value of the regulation improvement provided by non-Treaty storage to be approximately \$12 million annually. This benefit is part of BC Hydro’s power sales revenue, and helps to minimize customer rates.

Kootenay River Power Generation Benefits

The ability to better manage flows due to the Duncan Dam and the Libby Dam greatly enhanced the power generation potential of the lower Kootenay River. That potential has subsequently been utilized through construction of the Kootenay Canal and Brilliant Expansion projects. With those facilities and other system improvements, the additional power generated is estimated at 3,250 GWh annually. The revenues from those projects are included in the income for BC Hydro and Columbia Power Corporation.

Other Provincial Benefits

The Province also gains tax revenues for wages for permanent employees of BC Hydro, Columbia Power Corporation and Columbia Basin Trust, and for contracted employees, or project labour income from those organizations, the Fish and Wildlife Compensation Program and the Water Use Planning programs. There are also provincial tax benefits on the wages paid to contracted employees working on capital projects, such as the current Mica Dam Units #5 and #6 and Columbia Power Corporation’s project at Waneta. The Province also receives tax benefits on the materials used in construction and maintenance. Fees paid at Provincial Parks also become part of provincial revenue, as do fees paid for fishing licences for recreational fishing on the reservoirs. No estimate of the total value of these benefits is documented.



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